

**Testimony by James D. Boyd
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Thank you, Chairman Kehoe. I am Energy Commissioner Jim Boyd, Commission Vice Chair, appearing today for the California Energy Commission. I serve as the State Liaison Officer to the U.S. Nuclear Regulatory Commission, which is the federal agency that regulates the safety of nuclear power plants in the U.S.

As you have asked, I plan this afternoon to give you an overview of the California Energy Commission's responsibilities and activities regarding California's nuclear power plants, to summarize the major findings related to nuclear power from the Energy Commission's Integrated Energy Policy Reports and workshops, and to briefly review issues related to any proposed construction of new nuclear plants in California.

Overview of the Energy Commission's Role and Activities

The primary responsibility for overseeing nuclear power plants in the U.S. rests with the federal Nuclear Regulatory Commission. State governments retain responsibility for regulating the non-radiological environmental impacts of the plants, such as impacts from plant cooling, and for assessing the role of nuclear power as part of the state's energy supply.

The Energy Commission has no jurisdiction over any of the existing nuclear plants operating in California today. This is because Diablo Canyon, owned by Pacific Gas & Electric, and San Onofre, owned by Southern California Edison Co., were specifically exempted from the Energy Commission's licensing authority and from the California nuclear waste laws enacted in 1976.

However, the Energy Commission does have a number of obligations related to existing and new nuclear power plants in the state:

1. First, under the 1976 nuclear waste laws, no new nuclear plants can be built in California until the Energy Commission determines that a means for the permanent disposal of spent nuclear fuel has been demonstrated and approved by the federal government.

2. In addition, the Energy Commission coordinates California's official response to major proposals and activities related to federal programs for spent nuclear fuel transportation, disposal, and reprocessing.
3. And recently, the Energy Commission has been directed under Assembly Bill 1632 (Chapter 722, Statutes of 2006) to conduct a comprehensive assessment of Diablo Canyon and San Onofre. AB 1632, which was authored by Assemblyman Sam Blakeslee and signed into law in 2006, requires the Energy Commission to examine several key issues:
 - The vulnerability of the state's nuclear plants to a major disruption from an earthquake or from plant aging;
 - The impacts from such a disruption;
 - The costs and impacts of the accumulation of nuclear waste at these reactors; and
 - The future role of nuclear power plants in California.

The AB 1632 study will also compare the "cradle-to-grave" costs and environmental impacts from nuclear power with the costs and impacts of alternative baseload plants that could be used in California.

The AB 1632 study has just begun and will be completed in November 2008.

Summary of Integrated Energy Policy Report Nuclear Findings

Now turning to the Energy Commission's recent findings. Every two years the Energy Commission prepares an overall review of the state's energy situation and makes policy findings in the *Integrated Energy Policy Report* or "IEPR." In 2005, and again in 2007, that review included a comprehensive assessment of nuclear power and nuclear waste management. Two days of public workshops on these issues were held in August 2005 and again in June 2007.

Panels of experts from around the country participated in these workshops and provided insight on the operation of California's nuclear plants; the status of the federal waste disposal and reprocessing programs; and a wide range of issues affecting nuclear power, such as economics, plant aging, security, and environmental impacts. The Energy Commission's reports on nuclear power and workshop transcripts are available at the Energy Commission's web site at www.energy.ca.gov/2007_energypolicy/

The Energy Commission's 2005 *IEPR* reaffirmed our 1978 findings that a technology for the permanent disposal of high-level nuclear waste has been neither demonstrated nor

approved. We found that the federal waste disposal program is plagued by technical uncertainties, legal challenges, and managerial problems. As a result, California utilities must expect to retain spent fuel in storage facilities at nuclear plant sites for an indefinite time to come.

The *2005 IEPR* recommended that the state evaluate the long-term public safety and cost implications of accumulating spent fuel at California's operating plants. We recommended that some portion of the funds contributed by California ratepayers to build a federal waste repository be returned to the state to defray the costs of long-term on-site spent fuel storage. In the *2007 IEPR* we recommended that the state take an active role in the Yucca Mountain licensing proceeding to protect California's interests and continue to participate in planning activities for nuclear waste shipments.

We also found in 2005 and again in 2007 that nuclear fuel reprocessing, where spent fuel is separated into high-level radioactive wastes and reusable fuel, remains more expensive than waste storage and disposal and could potentially increase the proliferation of nuclear weapons materials. A recent National Academies panel similarly found that the federal government's major new reprocessing initiative would be extremely expensive, costing tens of billions of dollars or more. The panel concluded that the rationale for this initiative is unpersuasive, that there are major uncertainties about its ability to address U.S. waste disposal issues, and that the program should not go forward at its current pace.

The *2007 IEPR* also noted that a renewed interest in nuclear power has emerged over the last few years. This surge in interest, which I will speak more about next, has already impacted current nuclear plants in the form of substantially higher prices for nuclear fuel.

New Interest in Nuclear Power

To begin, no new nuclear plants have been ordered in this country since the Three Mile Island accident in 1979. Recently, there has been renewed interest in nuclear power spurred by new federal financial incentives, growing demand for electricity, increased concern about global warming, and the cost and implications of dependence on fossil fuels, including natural gas and coal.

Since the Three Mile Island accident, the nuclear industry has worked to improve its own safety practices and technology. Nuclear operators now routinely share safety data and lessons learned, recognizing that, "an accident at a nuclear plant anywhere is an accident everywhere."

As a measure of the renewed interest in nuclear power, there are something like 31 proposals for new nuclear plants in this country, put forward by 17 different companies. Electric power companies have informed the U.S. Nuclear Regulatory Commission of their intent to submit 21 combined construction and operating license applications for 32 units through 2009—five by this December. The first three of these applications have

been filed for five units in Texas, Alabama, and Maryland.

In Fresno, a group of business leaders has proposed the construction of a new 1,600 MW nuclear plant in Fresno using waste water for plant cooling. Nevertheless, the likelihood of a new nuclear power plant being built in California within the next decade is low for a variety of reasons.

Challenges to New Plant Construction in California

The first and most obvious challenge is that state law prohibits new nuclear plant construction in California until a federal permanent waste disposal technology has been demonstrated and approved. The federal program is focused on the construction of a deep, underground permanent repository at Yucca Mountain in Nevada. But the most optimistic estimate for when Yucca Mountain might open for business is 2017, and the director of that program has said that the date is more likely to be 2020 and could slip even further unless Congress authorizes significantly more funds.

In addition, a former U.S. Nuclear Regulatory Commissioner has said that the Yucca Mountain Program is deeply flawed and that it may be time to rethink the project. Moreover, of the four criteria recommended by the International Atomic Energy Agency for a permanent geologic waste repository, the Yucca Mountain site meets only two.

In the absence of a repository, California must plan for continued accumulation and interim storage of high-level radioactive waste at existing reactor sites, even though none of the sites were originally designed for such long-term storage.

A second challenge to new plant construction is cost. Just as in the 1970s and 1980s when the current generation of nuclear plants was planned and built, new plants face high construction costs and resulting financial risk. During the 1970s and 1980s the costs and time frame for building new plants greatly exceeded anticipated budgets and schedules. For example, construction costs at Diablo Canyon were estimated at \$320 million in 1968. That estimate was exceeded by more than \$5 billion. Likewise, the initial 1971 estimate for San Onofre 2 and 3 was \$436 million; that estimate was exceeded by over \$4 billion.

For new plants, developers indicate they plan to use standardized designs, which they expect will lower prices and reduce construction time. However, financial risk remains high because of the high capital costs, regulatory uncertainties that could delay construction and increase costs, and potential public opposition. General agreement among industry experts at our recent workshop was that a new 1,600 MW nuclear power plant would cost about \$4 to \$6 billion. Because of the high financial risk entailed in the development of new nuclear power projects, project proponents have indicated that their ability to proceed depends on the availability of unprecedented 100 percent loan guarantees backed by the federal treasury.

Earthquake safety considerations also present challenges for siting a new nuclear

facility in California. California's most seismically active areas are located along the coast. Diablo Canyon, for example, is located three miles from a major fault. Siting additional nuclear reactors along the coast could be an extremely costly proposition due to the need to meet stringent seismic safety requirements.

In addition, because nuclear units convert heat to electricity less efficiently than other generating technologies, nuclear plants require more water for cooling than other types of plants -- 2.5 billion gallons of water per day for Diablo Canyon alone. Daily operations of once-through cooling systems at Diablo Canyon and San Onofre have resulted in major impacts on marine ecosystems. Siting a new unit along California's coastline would raise questions regarding additional impacts on the marine environment. Once-through cooling restrictions could also limit siting options and increase construction costs.

A further hurdle for new nuclear plant construction would be the state's policy for new energy resources. In 2003, California's principal energy agencies adopted an energy policy that places high priority on improved energy efficiency and looks first to renewable and distributed energy resources (electricity produced close to where it is used) to meet new electricity generation needs. This policy is the foundation for recommended state energy policies.

The Energy Commission's *2005 IEPR* similarly adopted a policy that encourages the development of the most efficient, clean, and cost-effective energy options, such as energy efficiency, renewable energy technologies, and distributed generation. While advanced nuclear reactor designs may be important resources in the long term, there likely are more cost-effective electricity resource and energy efficiency options in the near term.

In addition, public support for nuclear power, though rising, remains soft. A national poll conducted by the Massachusetts Institute of Technology (MIT) earlier this year found that acceptance of nuclear power has increased since 2002 but that a majority of the public still do not want to see new plants built. Similar results have been found in California, even when combined with questions on global warming.

A recent poll of California adult residents that was sponsored by the William and Flora Hewlett Foundation found that 78% of Californians favor the state law that requires reducing GHG emissions to 1990 levels by the year 2020. At the same time, a majority remains opposed to building more nuclear power plants: 54% oppose while only 37% support. At our hearings in June, Joe Turnage of Constellation, who will be speaking later today, categorized support for nuclear power as a micron deep.

Much of this opposition stems from the nuclear waste issue. In the MIT poll, two-thirds said they would support a significant expansion of nuclear power "if there were effective waste storage." However, only 28 percent agreed that "nuclear waste could be stored safely for long periods of time."

Moreover, 65 percent opposed using the proposed storage site at Yucca Mountain without the agreement of the state of Nevada, and only 19 percent thought that Yucca Mountain should be used without further delays. As the MIT researcher concluded, "getting the public behind a serious expansion of nuclear power in the U.S. is going to be difficult."

Conclusion

We will hear expert witnesses this afternoon discuss nuclear plant performance, costs, greenhouse gas impacts, safety, security, and waste disposal. The Energy Commission also investigated these issues as part of the *2007 IEPR*. From these investigations, we concluded that:

1. Nuclear energy plays an important role in California's current electricity supply, providing 13% of the state's baseload power.
2. The U.S. is experiencing a "nuclear renaissance" as this technology is increasingly seen as a mitigation strategy for global climate change. Encouraged by federal regulatory and financial incentives, increased volatility of fossil fuel prices, and continuing growth of energy demand, nuclear power is gaining greater visibility.
3. About half of the nuclear power plants in the U.S. have received 20-year renewals on their operating licenses and some utilities and generators have expressed interest in building new plants.
4. However, nuclear power still faces a number of barriers, including high capital costs, regulatory risks associated with once-through cooling, and potentially severe effects from accidents, acts of nature or terrorism.
5. The waste storage and disposal issue continues to hamper the future development of nuclear power. Although California consumers have paid over \$1 billion to support federal efforts to develop a permanent repository for spent fuel at Yucca Mountain in Nevada, the repository is not expected to open until 2021, if at all. In the absence of a federal repository, California must plan for the continued accumulation and interim storage of high-level radioactive waste at existing reactor sites.
6. The financial risks associated with new plant construction will be high. Recent findings related to the cost for new power plant construction suggest that new plants will be very expensive, costing between \$4-6 billion. While these plants are relatively inexpensive to run, they are very expensive to build. In the past, new plant construction has required extraordinary ratepayer guarantees to cover construction costs. Some developers believe that new technologies, federal subsidies, standardized reactor designs, revised plant licensing procedures, and relatively low interest rates will keep costs down.

7. Reprocessing is more expensive than waste storage and disposal and continues to have adverse implications for the U.S. effort to halt the proliferation of nuclear weapons.
8. Nuclear power has lower greenhouse gas emissions than fossil fuels. However, in light of the challenges involving developing new nuclear power plants, the Energy Commission does not expect significant contributions from new power plant construction toward meeting the state's AB 32 goals by 2020.
9. The Energy Commission will continue to assess federal waste disposal and transportation programs and the costs and impacts associated with the continuing accumulation of waste at California's reactors.

That completes my prepared remarks. I would be happy to answer any questions.